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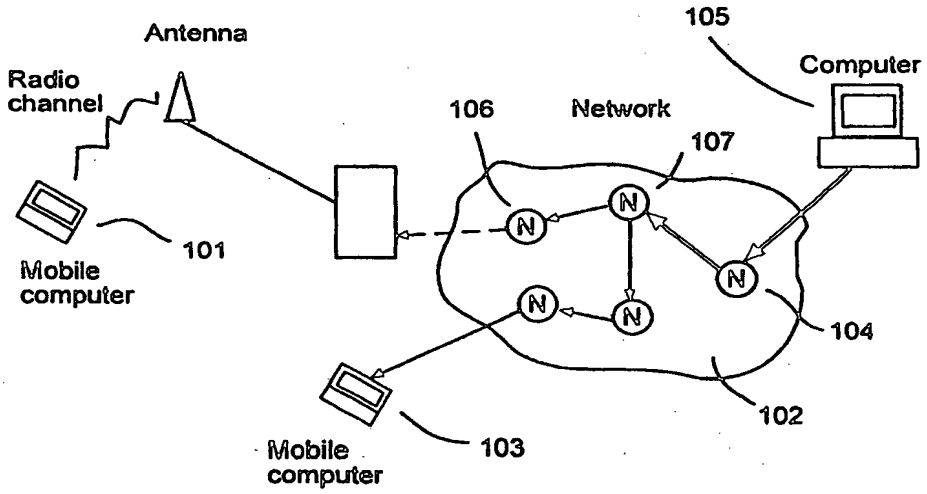
(54) Title: RESOURCE OPTIMIZATION FUNCTION IN A DATA AND TELECOMMUNICATIONS SYSTEM



(57) Abstract

The invention relates to a method at a telecommunications system and a data communications system which adapts resource reservation protocol for fixed networks (102) to radio networks with large variation in bandwidth and quality. At hierarchical coding, a data stream is divided into separate data streams with different priorities. By the resource reservation protocol, then resources in the fixed network (102) for the data streams are reserved. A node in the fixed network throws the data streams according to a predecided priority if the transmission capacity of the node decreases. If the transmission capacity at this node decreases, and the quality requirement of a data stream fails to be kept up, the data stream in question is thrown. After that, the node transmits a message to the nodes where the resource reservations are, towards the transmitter (105) with the following content: update the resource reservations for the data stream, i.e. keep the resource reservations which are required to transmit the data stream; use the reserved resource temporarily for other traffic; throw the data stream until different is stated.

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TITLE OF THE INVENTION: RESOURCE OPTIMIZATION FUNCTION IN A DATA AND TELECOMMUNICATIONS SYSTEM

FIELD OF THE INVENTION

The present invention relates to a method at a data and telecommunications system for transmission of data streams between a receiving terminal and a transmitting terminal via at least one fixed network including just any number of nodes and another network consisting of links with large variation in bandwidth and quality, at which a resource reservation protocol reserves resources in said fixed network for said data streams.

PRIOR ART

A computer transmits data over a network to a receiving computer. At hierarchical coding, a data stream (with real time requirements, i.e. demands on controlled delay) is divided into separate data streams with different priorities. The data streams have different demands on quality. By a resource reservation protocol, resources then are reserved in the network for the data streams. Separate reservations are made for each data stream in all nodes from the receiver to the transmitter. At hierarchical coding, the node throws data streams according to a predefined priority if the transmission capacity of the node has decreased. Since the data streams have real time demands, data will not be buffered.

When hierarchical coding is used over a radio channel with large variation in bandwidth and quality, the number of data streams which can be transmitted over the radio channel will vary rapidly. The radio channel is the transmission link which in most cases will set a limit to the number of data streams that can be transmitted to the receiver. The data streams that are stopped at the node closest to the radio channel are still transmitted in the

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fixed network and therefore load the fixed network without due cause. At the same time, the receiver wants to keep its reservations in the network also during the time when some data streams are stopped, because the reservation may not be possible to retrieve if it is deleted. At unicast traffic, i.e. one receiver of data streams and separate resource reservations for each receiver, it is possible to signal to the transmitter to stop the transmission of a data stream. At multicast traffic, i.e. a plurality of receivers of the same data streams, resources are reserved in common in nodes with data streams in common. For that reason the transmitter cannot stop the transmission of a data stream since all other receivers then should be affected.

The aim of the present invention consequently is to solve this problem and provide multicast traffic without loading the fixed network without due cause.

SUMMARY OF THE INVENTION

This aim is achieved by a method at a data and telecommunications system for transmission of data streams between a receiving terminal and a transmitting terminal via at least one fixed network including just any number of nodes and another network consisting of links with large variation in bandwidth and quality, where a resource reservation protocol reserves resources in said fixed network for said data streams, at which said protocol attends to that if the transmission capacity of a node decreases and falls below the quality requirements of a specific data stream, said specific data stream is thrown, whereupon said node transmits a message which is executed in all nodes in said fixed network where resource reservations are provided towards said transmitting terminal, which message includes the steps of:

- updating said resource reservation for said specific data stream;

- utilizing said resource reservation temporarily for other traffic;

- throwing said specific data stream until different is stated.

The invention shows a plurality of advantages in comparison with known technology. For instance, the fixed network will, with this resource optimization function, have a considerable capacity improvement, i. e. the network will not be loaded by data which in any case is thrown at the node of lacking capacity.

The receiver will not lose its resource reservations during the time a data stream is stopped, which can happen if the receiver has to make new resource reservations each time the number of data streams is changed.

Resources which in other cases would not be utilized during the time a data stream is momentarily stopped, now can be utilized.

At multicast traffic, data will be thrown in a node as close to the transmitter as possible, without other receivers of the multicast traffic being affected.

Further characteristics of the present invention are given in the sub-claims.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following a detailed description of an embodiment of the invention is given, with reference to the enclosed drawings, of which:

Figure 1 is a diagrammatical presentation of the tele and data communications system according to the invention;

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Figure 2 is a diagrammatical presentation of a graph related to hierarchical coding according to the present invention.

DETAILED DESCRIPTION OF AN EMBODIMENT OF THE INVENTION

Figure 1 shows a mobile computer, 101, connected to a fixed network, 102, consisting of nodes (N) via a radio channel with varying quality. The dashed arrow shows data streams which are transmitted to the mobile node 101. The bold arrow shows data streams which are in common for all receivers 101 and 103.

The mobile computer 101 can receive unicast traffic and multicast traffic. At unicast traffic, the nodes deal with the resource reservations of the data streams separately. At multicast traffic, the nodes deal with the resource reservations in common when the data streams are in common for all receivers 101 and 103. In Figure 1, the node 104, closest to the receiver 105, deals with the resource reservations in common.

The invention is primarily intended for the functionality in the node 106 at the interface towards the radio network, and in the nodes 104 and 107 which the data streams pass on the path from the transmitter 105, i.e. the computer, to the receiver 101, i.e. the mobile computer.

The functionality adapts resource reservation protocols created for fixed networks 102 to networks consisting of links with larger variations in bandwidth and quality, preferably radio networks. Previously known technology does not deal with resource optimization at resource reservations and hierarchical coding over links with varying quality.

Theoretically, the resource optimization function solves the network utilization problem at hierarchical coding, both for unicast traffic and multicast traffic.

If the transmission capacity at a node (in most cases the node 106 at the radio channel), see Figure 1,

decreases, and the quality requirement of a data stream is no longer maintained, then the data stream in question will be thrown. After that the node transmits a message to the nodes (where the resource reservations are) towards the transmitter 105 (the computer in Figure 1) with the following content:

- Update the resource reservation for the data stream, i.e. keep the resourse reservations that are required to transmit the data stream.
- Use the reserved resource temporarily for other traffic.
- Throw the data stream until different is stated.

If the transmission capacity in the node increases, and the quality requirement for a data stream is fulfilled, the data stream shall be transmitted again. The node transmits a message to the nodes (where the resource reservations are) towards the transmitter 105 with the following content:

- Update the resource reservation for the data stream, i.e. keep the resourse reservations that are required for transmission of the data stream.
- Use the reserved resource for the intended data stream.

Both unicast and multicast traffic here are dealt with, with the same signalling message. At multicast traffic, resource reservations which are in common for a plurality of receivers 101 and 103 will not be affected.

Figure 2 shows the internal priority of the data streams, where the data stream 1 has the highest priority and is not limited in time by bandwidth functions.

Data streams 3 are strongly limited in time by the bandwidth function. The data streams consequently are

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hierarchically coded, where data stream 1 is highest in the hierarchy.

In the following an example is given of a conceived scenario:

Mobile computer 101 receives data with real time demands (controlled delay) from a transmitting computer 105 (Figure 1).

The mobile computer 101 selects to receive the data stream in a plurality of data streams with different priorities (Figure 2).

In each node resources are reserved separately for each data stream.

The node 106 closest to the radio channel receives momentarily information about which transmission capacity that is available over the radio channel. The bandwidth decreases, and the node 106 closest to the radio channel is forced to throw the lowest prioritized data stream (Figure 2).

In order not to overload the network 102 with data which in any case shall be thrown at the node 106, at the radio channel, a message is transmitted to the transmitter 105 (the computer) that it shall stop the transmission of the data stream of the lowest priority. The message which is transmitted to the transmitter 105 also contains the following information which is executed in all nodes 107 and 104 on the path to the transmitter 105:

- Update the resource reservation for the data stream, i.e. keep the resourse reservations that are required to transmit the data stream.
- Use the reserved resource temporarily for other traffic.
- Throw the data stream until different is stated.

Both unicast and multicast traffic here are dealt with, with the same signalling message. In the cases when the resources reservation is in common, all subjacent nodes must require that certain data streams be stopped for this request being forwarded in the common reservation. Consequently the data streams will not always be thrown in the nodes 104 where the resource reservation is in common.

The bandwidth will increase and the node 106 closest to the radio channel decides that the data stream of the lowest priority again can be received.

A message is transmitted to the transmitter 105 that the data stream of the lowest priority shall be transmitted.

The message which is transmitted to the transmitter 105 contains the following information which is executed in all nodes 107 and 104 on the path to the transmitter 105.

- Update the resource reservation for the data stream, i.e. keep the resourse reservations which are required to transmit the data stream.
- Use the reserved resource for the intended data stream.

The above mentioned is only to be regarded as an advantageous embodiment of the present invention, and the extent of protection is only defined by what is indicated in the following patent claims.

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PATENT CLAIMS

1. Method at a data and telecoomuncations system for transmission of data streams between a receiving terminal (101) and a transmitting terminal (105) via at least one fixed network (102) including just any number of nodes and another network consisting of links with large variation in bandwidth and quality, at which a resource reservation protocol reserves resources in said fixed network (102) for said data streams, c h a r a c t e r i z e d in that said protocol attends to that, if the transmission capacity of a node, preferably the node (106) closest to said other network, decreases, and the quality requirement of a specific data stream fails to be kept up, said specific data stream is thrown, whereupon said node by means of said protocol transmits a message which is executed in other nodes where said resource reservations are, to said transmitting terminal (105), which message includes the steps of:

- updating said resource reservation for said specific data stream;
- utilizing said resource reservation temporarily for other traffic;
- throwing said specific data stream until different is stated.

2. Method according to patent claim 1, c h a r a c t e r i z e d in that if the transmission capacity in said node increases and the quality requirement for said specific data stream is fulfilled, said specific data stream shall be transmitted again, at which said node by means of said protocol transmits a message to said second nodes, where said resource reservations are, towards

said transmitting terminal (105), which message includes the steps of:

- updating the resource reservation for said specific data stream;

- using said resource reservation for said specific data stream.

3. Method according to patent claim 1 or 2, c h a r a c t e r i z e d in that said other network is a radio network including at least one radio channel.

4. Method according to patent claim 3, c h a r a c t e r i z e d in that said node constitutes an interface towards said radio channel, at which said radio channel sets the limit regarding how many data streams that can be transmitted from said transmitting terminal (105) to said receiving terminal (101).

5. Method according to some of the previous patent claims, c h a r a c t e r i z e d in that it is utilized at hierarchical coding of said data streams.

6. Method according to patent claim 1, c h a r a c t e r i z e d in that, at multicast traffic, said specific data stream in said other node as close to said transmitting terminal (105) as possible, is thrown without other receiving terminals (103) of the multicast traffic being affected, whereby said fixed network (102) is not loaded by said specific data stream, which in any case is thrown at said node lacking capacity.

7. Method according to some of the previous patent claims, c h a r a c t e r i z e d in that said node in said fixed network (102) which constitutes radio interface towards

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said radio channel receives momentary information about which transmission capacity that is available on said radio channel, at which said node by means of said protocol reserves resources in said fixed network regarding the transmission capacity of said radio channel.

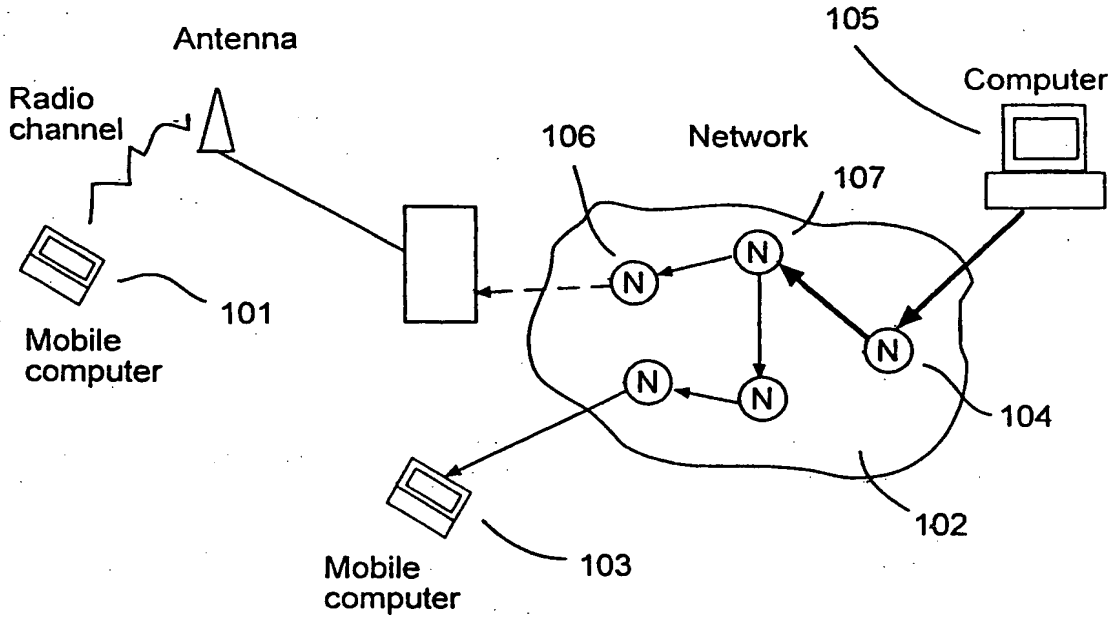

Figure 1

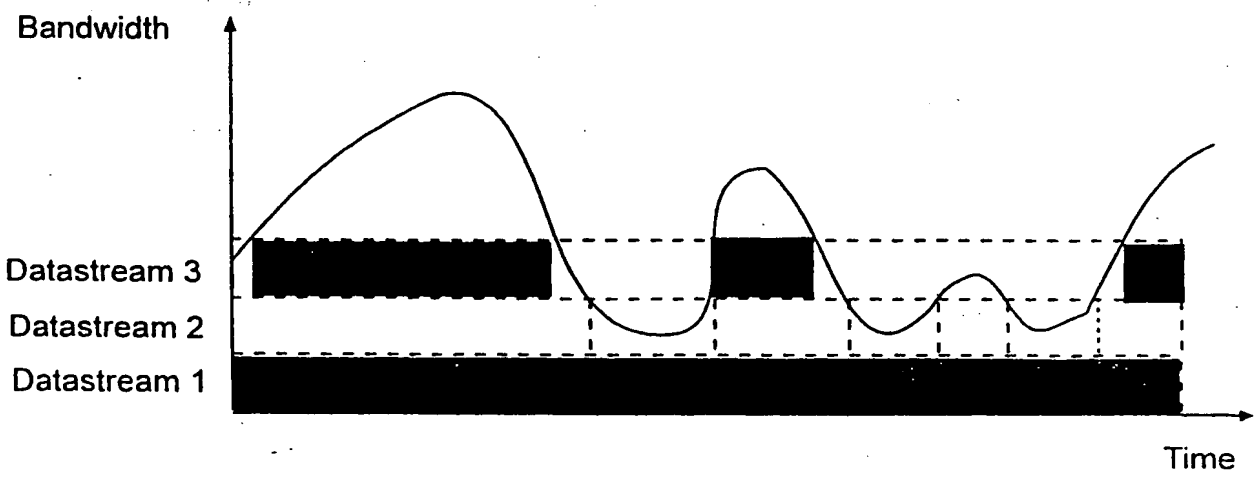

Figure 2

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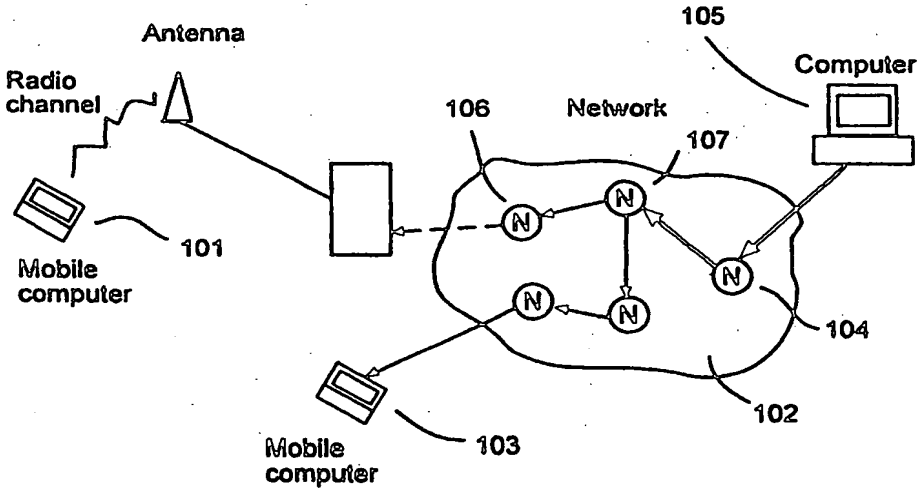

(57) Abstract

The invention relates to a method at a telecommunications system and a data communications system which adapts resource reservation protocol for fixed networks (102) to radio networks with large variation in bandwidth and quality. At hierarchical coding, a data stream is divided into separate data streams with different priorities. By the resource reservation protocol, then resources in the fixed network (102) for the data streams are reserved. A node in the fixed network throws the data streams according to a predecided priority if the transmission capacity of the node decreases. If the transmission capacity at this node decreases, and the quality requirement of a data stream fails to be kept up, the data stream in question is thrown. After that, the node transmits a message to the nodes where the resource reservations are, towards the transmitter (105) with the following content: update the resource reservations for the data stream, i.e. keep the resource reservations which are required to transmit the data stream; use the reserved resource temporarily for other traffic; throw the data stream until different is stated.

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A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04L 12/56, H04L 29/06
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Minimum documentation searched (classification system followed by classification symbols)

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, EPODOC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0535860 A2 (AMERICAN TELEPHONE AND TELEGRAPH COMPANY), 7 April 1993 (07.04.93), column 2, line 12 - line 30, abstract, see the figures --	1-7
A	US 5481537 A (KENNETH J. CRISLER), 2 January 1996 (02.01.96), column 2, line 33 - column 6, line 12, figures 2-6, abstract --	1-7
A	EP 0478190 A2 (AMERICAN TELEPHONE AND TELEGRAPH COMPANY), 1 April 1992 (01.04.92), page 2, line 36 - line 58, abstract -- --------	1-7

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INTERNATIONAL SEARCH REPORT

Information on patent family members

03/05/99

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PCT/SE 98/01975

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